

Vorce, Charles Marvin

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A PAPER

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OF

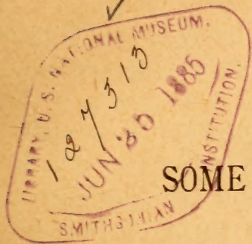
CLEVELAND, OHIO.

By C. M. VORCE, Esq.

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PAPER READ BEFORE THE KIRTLAND SOCIETY OF NATURAL SCIENCES,
FEBRUARY 16, 1880.

By C. M. VORCE, Esq.

The waters of the great lakes are well known to abound in varied forms of life, the most generally known of which are the products of the fishing industry, the encouragement by governmental aid to fish propagation serving to render this industry and its results familiar to all. The annual catch of fish and the vast beds of mollusca found in some localities constitute about all that a great mass of people know of the life inhabiting these waters. And with the exception of a few reflective minds, the present condition of life in the waters of the lakes is popularly supposed to have always existed in about the same condition. As numerous and prolific as are the popularly known forms of life inhabiting the waters of the lakes, careful search with adequate means reveals a vastly more abundant and prolific world of minute forms, both animal and vegetable, many of which are only visible with microscopical aid.

The naturalist knows more or less thoroughly of the varied forms of visible life abounding in the waters, and of their sig-

nificance, and, if a microscopist as well, is likely to be familiar with the hosts of minute beings that people the same watery world.

A study of the microscopical forms of life in the lake waters reveals in their forms and habits of life a vast significance, corroborative of other evidences of the former condition of the lakes as a sea. In pursuing the study of the minute forms of life in the lake waters, the most convenient plan, and that generally adopted, is to take samples from the water supply by means of straining or filtering. How closely and accurately the material thus obtained represents the conditions existing in the great body of water is not easily ascertainable, and it is not unlikely that some forms, and perhaps many of them, exist in the waters of the lake that are not obtainable in the manner referred to. But, proceeding with the process of examination by filtering, we find throughout the year vast quantities of the forms of life common to fresh water, such as various species of diatoms, desmids, protococcus, oscillatoria, and other families of confervoidca, and numerous entomostraca, infusoria, rotatoria, rhizopoda, and other classes of protozoa.

Among all these varied forms of teeming life with which the lake water abounds, there are none, so far as I know, which might not be expected to be found in fresh water, except among the diatoms. But of the sixty odd species of diatoms which are found in the filterings of our water supply, there are at least three, and perhaps more, which are representatives of marine forms; these are the *Rhizosolenia eriensis*, *Actinocyclus niagaræ* and *Amphiprora ornata*, and to these should be added, in my judgment, the *Stephanodiscus niagaræ*.

Of these forms the *Rhizosolenia eriensis* was first collected by Mr. H. C. Gaylord from the water supply of this city, and was described and named by Professor H. L. Smith, of Geneva, New York. This is the only species of *Rhizosolenia* yet found in fresh water, all other species of the genus yet described being marine or fossil, and the recent forms mostly found in the stomachs of salpæ and ascidians. This diatom has so far only been found, to my knowledge, in the waters of the lakes at Cleveland, Buffalo and Chicago. The *Amphiprora ornata*, found in considerable numbers in the lake water at certain seasons, has also been reported

from two other localities in Ohio, from New York and from Florida, but sparingly. The *Actinocyclus niagaræ*, named by Professor H. L. Smith, and described in the American Quarterly Microscopical Journal, October, 1878, was also sent to him by Mr. Gaylord, and has not yet, so far as I can learn, been reported from any other locality than Cleveland. The other species of *Amphiprora* are marine, and those of *Actinocyclus* marine or fossil.

Some other species of diatoms found in the lakes are so modified in form as to be perceptibly different from the same typical species found elsewhere. From these facts Prof. Smith, above named, suggested the query whether salt or brackish water might not be found at the bottom of the lakes; but from the shallowness of Lake Erie that is improbable in this case, and my own conclusion is that these forms of diatoms are survivors of the ancient sea, which have, during the subsidence of the former sea, survived the change through brackish to fresh water, perhaps not modified in form during the change. As bearing upon this view, many facts which have come under my observation may be cited. Some three or four years ago, after repeated desultory examinations of the lake water, I began a systematic course of taking filterings, and at first supposed that filterings of each of the four seasons of the year would display the species of the year; but during the second year of such observations I became convinced that more frequent tests were needed, and took filterings from twice to three times per month, and during the year 1879 I saved a filtering of each week of the year, except during two short absences. Examination of the filterings when taken confirmed what had been deduced from former observations, that the forms of life in the lake water exhibit a well marked periodicity, the limits of which I have not continued the observation far enough to exactly define at present, but which as far as the diatomaceæ are concerned, can be in general terms stated thus: During that part of the year from about the first or middle of February to about the first of May, the variety of form is greater; from thence to about November 1 the abundance of the prevalent forms is greatest, and from November 1 to about February 1 the disappearance of warm weather forms and appearance of the cold weather forms goes on;

thus producing a periodicity of three seasons in the year. During the winter and the early spring the *Stephanodiscus niagaræ* is the prevalent form, giving place to *Melosira crotonensis* as the warm weather approaches, which soon yields prominence to *Tabellaria fenestrata*, which continues the predominant form until fall, when the *Melosira* again appears, and soon becomes equa'ly numerous, both forms, as cold weather approaches, becoming scarcer, while the *Steph-niagaræ* reappears and rapidly increases in numbers, until at times it forms almost the whole of some winter gatherings. The *Actinocyclus niagaræ*, so far as can yet be judged, appears most frequently in the late winter and early spring gatherings; seldom or never in summer. The *Amphiprora ornata* and *Rhizosolenia eriensis* are found occasionally at all seasons, but in greatest abundance in the winter and early spring gatherings. During some weeks in July and August, 1879, neither of these diatoms were found, the gatherings consisting almost exclusively of *Tabellaria fenestrata*. The forms of *Surirella* and *Cymatopleura* are also most abundant in the early spring gatherings.

The influence of storms on so shallow a lake might well be supposed to have considerable influence upon the contents of the water supply, but so far as I have been able to observe, no difference in the forms of diatoms found in the filterings is caused by storms, but considerable mud is brought with them.

This periodical abundance of the forms before mentioned, the *Actinocyclus*, *Rhizosolenia* and *Amphiprora*, in the colder season, and their partial disappearance in the hottest season of the year, and the uniform greater abundance of the *Stephanodiscus* during the winter, also becoming scarce in summer, is strong evidence, in my mind, that all these forms are survivors of the cold seas, and were, perhaps, the chief forms then prevalent in those waters; for which reasons the colder temperature of the present lakes is most congenial to them and best suited to their development.

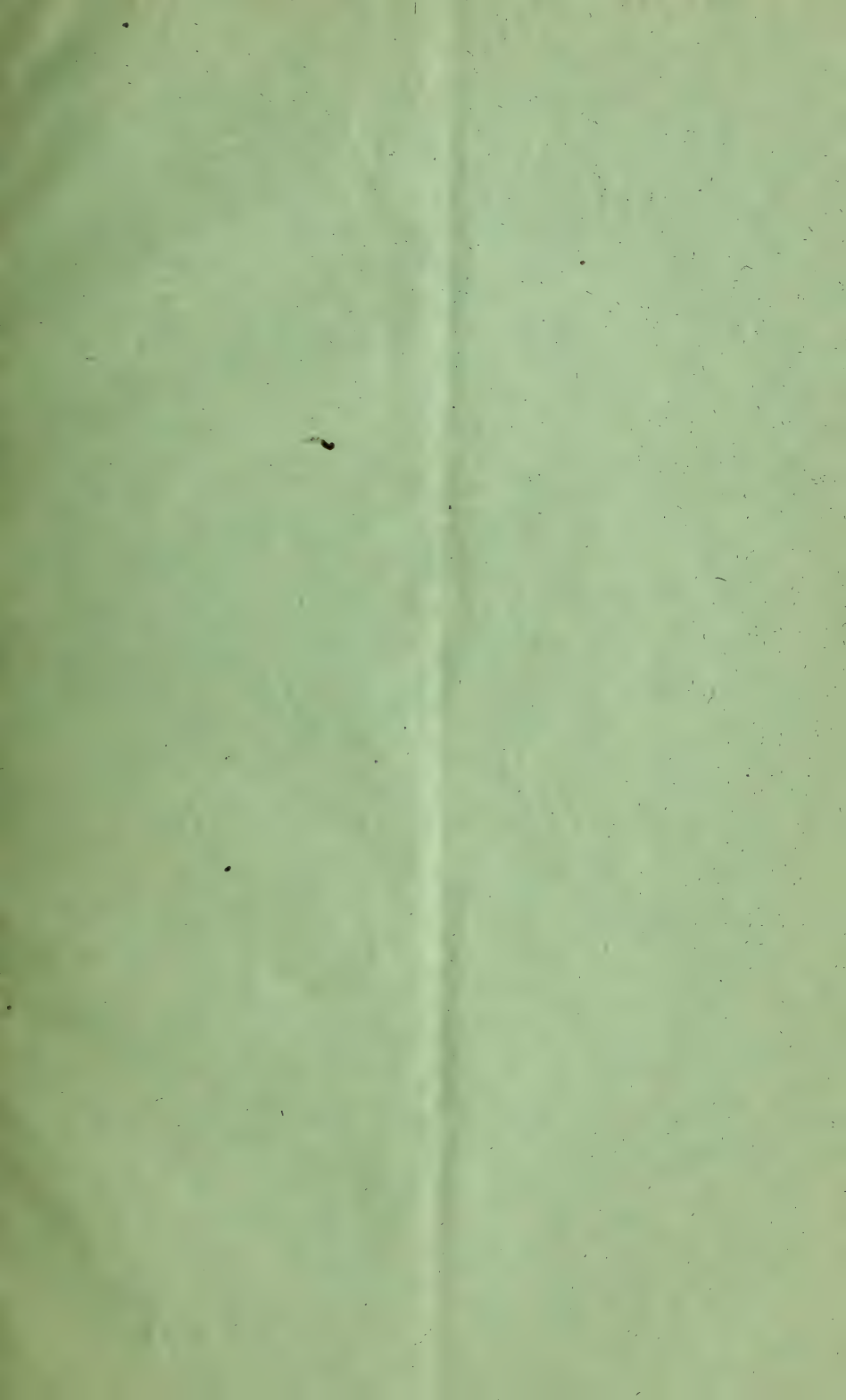
As the changes that left our present lakes progressed, these forms kept pace in their modification with that of their habitat, new forms appearing and being introduced by various causes, until the present condition has been reached, and I entertain no doubt that if future changes should replace our lakes with arc-

tic seas, these peculiar diatoms would then be found the chief and perhaps the only survivors of our numerous present forms.

It may be of some interest to state that in the year 1878, at the suggestion of a gentleman in Philadelphia, I sent to him repeated gatherings of diatoms from Lake Erie with a view of introducing the *Stephanodiscus niagaræ* into the fresh waters and clear spring ponds of that locality; but we did not succeed in getting them to live, although they will live for weeks here in a comparatively small amount of water.

Another matter should be mentioned, and that is that the character of the filterings taken on the same day varies in different parts of the city. I have seen forms of diatoms and infusoria quite abundant in a filtering made at the store of Mr. Gaylord, which forms could not be found at all in a filtering which was progressing at my own house during the same time, and other striking instances have been noticed; but as the periodicity of forms is a characteristic always observable wherever the filterings are taken, it may be assumed that a continuous series of observations made upon filterings from the same faucet represents fairly well the characteristic of the general source of supply.

It would be of much interest to supplement the examination of the contents of the water supply with that of dredgings or soundings from the sediment of the lake bottom, and I hope eventually to be able to do this.



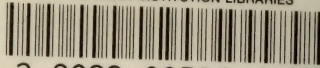








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